

Vermont.—Lunenburg, 27; Enosburgh Falls, 23; Burlington and Chelsea, 22; Strafford, 19; Northfield, 16.2; Jacksonville, 16; Brattleborough (a), 15.5; Cornwall, 14; Vernon, 13; Wells, 12. **Virginia.**—Lynchburgh, 17.2; Lexington, 15.7; Blacksburgh, 15; Nottoway C. H., 14.2; Richmond and Staunton, 14; Charlottesville, 12.5; Christiansburgh, 12; Dale Enterprise, 11.5; Salem, 11.4; Avon, 10.2. **Washington.**—Spokane, 13.1; Chelan, 11.3; Walla Walla, 10.7. **West Virginia.**—Parkersburgh, 21.2; Elkhorn, 16.2; Charleston, 14; Tannery, 13.2; Nuttallburgh, 12; Ella, 10.2; Harpers Ferry, 10. **Wisconsin.**—Crandon and Beloit, 20.1; Green Bay, 15.1; Kenosha, 15; Florence and Harvey, 13.9; Bayfield, 13.5; Embarrass, 13; Peshtigo, 12.6; De Pere, 12.5; Prairie du Chien, 12.4; Appleton, 12; Oconto, 11.7; Oshkosh, 11.2; Manitowoc, 11.1; Fond du Lac, 11; Cadiz, 10.6; Koepenick, 10.5; Lancaster and Portage, 10. **Wyoming.**—Sundance, 21.5; Fort Yellowstone, 14; Fort McKinney, 10.2.

DEPTH OF SNOW ON GROUND ON 15TH AND AT THE CLOSE OF THE MONTH.

Chart VI shows the depth of snow on the ground at the close of the month, as reported by regular and voluntary observers of the Weather Bureau.

On the 15th a depth of more than 10 was reported in extreme northern New England, central and western New York, eastern and western Lower Michigan, Upper Michigan, eastern North Dakota, over the east part of the middle plateau region, and from western Utah over the northern plateau region. The greatest depth was reported over southern Idaho, where it varied from 15 to 30, and in the mountains of Colorado, extreme northern Upper Michigan, and northeastern North Dakota, where it exceeded 30. A depth of 5 to 6 was reported in northern Arkansas, and trace to 0.5 on the middle Gulf coast.

At the close of the month a depth of 20 to 30 was noted at points in Idaho, Colorado, North Dakota, Upper Michigan, and New York; more than 10 over the northern plateau region and the north and east parts of the middle plateau, in eastern North Dakota, and in areas in the Lake region, New York, and northern New England, and trace of snow was reported as far south as Tennessee and central New Mexico.

HAIL.

Description of the more severe hailstorms of the month is given under "Local storms." Hail was reported as follows: 1st, Arkansas, Missouri, and Washington. 2d, Pennsylvania.

5th, Alabama, Georgia, Mississippi, and Tennessee. 6th, Georgia and Florida. 7th, Alabama. 9th, Alabama, Georgia, and Louisiana. 10th, Missouri. 11th, Louisiana and North Carolina. 12th, Alabama, Louisiana, and Mississippi. 13th, Nevada, Oregon, and Texas. 14th, Louisiana and Mississippi. 15th, North Carolina. 17th, Florida. 18th, Georgia and Texas. 19th, Louisiana and Texas. 20th, North Carolina. 24th, New Mexico. 26th, California. 29th, Arizona. 30th, Arizona, New Mexico, and Wisconsin. 31st, Arizona and New Mexico.

SLEET.

Description of the more severe sleet storms of the month is given under "Local storms." Sleet was reported as follows: 1st, Iowa, Kentucky, Michigan, Missouri, New York, and Vermont. 2d, Michigan, New York, and Ohio. 3d, New Hampshire. 4th, Ohio. 5th, Virginia. 6th, Alabama, Connecticut, Massachusetts, Mississippi, Nevada, New York, Pennsylvania, Texas, and West Virginia. 7th, Georgia, Nevada, and Texas. 8th, Arkansas. 9th, Alabama, Georgia, Mississippi, and South Carolina. 10th, Arkansas, Kentucky, Louisiana, Mississippi, Missouri, and North Carolina.

11th, Arkansas, Illinois, Indiana, Kentucky, Louisiana, Mississippi, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Texas, and Vermont. 12th, Arkansas, Indiana, Kentucky, Louisiana, Maine, Michigan, Mississippi, New York, Ohio, Pennsylvania, Tennessee, Texas, and West Virginia. 13th, Arkansas, Indiana, Kentucky, Louisiana, Maine, Mississippi, New York, Ohio, Tennessee, Texas, and West Virginia. 14th, Georgia, Louisiana, Mississippi, Ohio, Tennessee, Texas, and West Virginia. 15th, Connecticut, Georgia, Maine, Massachusetts, New Jersey, New York, North Carolina, and Virginia. 16th, Kentucky. 17th, Arkansas, Florida, Pennsylvania, and Texas.

18th, Arkansas, Connecticut, Kentucky, Louisiana, Mississippi, New Jersey, New York, North Carolina, Pennsylvania, Tennessee, Texas, Vermont, and West Virginia. 19th, Alabama, Colorado, Connecticut, Louisiana, Maryland, New Jersey, New York, North Carolina, Pennsylvania, Tennessee, Texas, Vermont, and West Virginia. 20th, Georgia, Louisiana, New Jersey, North Carolina, and Virginia. 21st, Texas. 23d, Ohio. 24th, Virginia. 25th, Kentucky. 27th, Maine. 29th, Ohio, Pennsylvania, and Utah. 30th, Massachusetts, Michigan, New Mexico, and Ohio. 31st, Colorado, Nebraska, New Mexico, and South Dakota.

WINDS.

The prevailing winds in January, 1892, are shown on Chart II by arrows flying with the wind. In New England and on the middle-eastern slope of the Rocky Mountains northwest to north winds were most frequently noted; in the middle Atlantic states, the Ohio Valley and Tennessee, the upper lake region, the upper Mississippi valley, and on the northeastern slope of the Rocky Mountains they were generally from southwest to northwest; in the south Atlantic states and the Missouri Valley, from west to north; over the Florida Peninsula, in the east Gulf states, over the middle plateau region, and along the south Pacific coast, from northwest to northeast; in the west Gulf states, from the north; in the lower lake region and on the southeast slope of the Rocky Mountains, from south to west; in the extreme northwest, from west to northwest; over the northern plateau region, from southeast to south; on the north Pacific coast, from east to south; and over the southern plateau region and on the middle Pacific coast, variable.

HIGH WINDS.

[In miles per hour.]

Wind velocities of 50 miles, or more, per hour were reported at regular stations of the Weather Bureau as follows: 1st, 60, nw., at Chicago, Ill.; 52, nw., at Milwaukee, Wis.; 50, se.,

at Lexington, Ky. 2d, 55, w., at Chicago, Ill. 6th, 60, e., at Block Island, R. I.; 50, e., at Tatoosh Island, Wash. 10th, 52, ne., at Kitty Hawk, N. C. 15th, 53, n., at Kitty Hawk, N. C. 19th, 56, s., at Huron, S. Dak. 21st, 55, sw., at Buffalo, N. Y. 25th, 69, se., at Fort Canby, Wash.; 66, e., at Tatoosh Island, Wash. 26th, 56, se., at Fort Canby, Wash.; 55, nw., at Atlantic City, N. J.; 54 nw., at Block Island, R. I.; 54, nw., at Woods Holl, Mass. 27th, 56, nw., at Woods Holl, Mass. 28th, 60, s., at Fort Canby, Wash. 29th, 61, s., at Fort Canby, Wash. 30th, 65, ne., at Block Island, R. I.

LOCAL STORMS.

1st.—Stormy weather prevailed from the upper lake region to Texas. At Marquette, Mich., rain changed to snow 11.50 a. m. A strong west gale began 6.45 p. m., and continued during the 2d, with maximum velocity 44 miles per hour from the northwest at 8.15 a. m., 2d. Amount of snowfall, 12.6 inches. At Detroit, Mich., a gale set in 9.12 a. m. Rain began at night, changing to sleet the morning of the 2d and to snow in the afternoon. The maximum wind velocity, 42 miles per hour from the southwest, was noted 4.32 a. m., 2d. The severest storm of the season was reported at Milwaukee, Wis. Rain fell during the day and snow at night. Steamers

remained in port, and some damage was caused to vessels in the harbor. A snowstorm, with a rapid fall in temperature, set in over central and northern Illinois in the afternoon. At Charleston, Ill., the temperature fell 33° in 6 hours.

A storm of snow and sleet, with rapidly falling temperature and high wind, prevailed over eastern Iowa. At Davenport, Iowa, a thunderstorm from the west began shortly after midnight. The temperature continued high with light southerly wind until 8 a. m., when the wind veered to northwest and increased in force, with a rapid fall in temperature in the early afternoon. Sleet began 1.45 p. m., and changed to snow, which continued during the day. Drifted snow caused a blockade on the electric street railway, and damage was caused to electric wires. The storm was also severe in northeast Kansas and northwest Missouri. A severe storm was reported at Mayfield, Ky., in the morning. At Chattanooga, Tenn., the pressure decreased rapidly; in the afternoon the wind reached a velocity of 36 miles per hour from the southeast, and 0.91 inch of rain fell in 45 minutes.

A thunderstorm from the southwest, with heavy rain, hail, and vivid lightning, struck Little Rock, Ark., about 5 a. m. The wind reached a velocity of 36 miles per hour, with an extreme velocity of 58 miles, damaging trees, etc. Destructive storms were also reported at Texarkana, Arkansas City, and Pine Bluff. At Grand Cane, La., a high wind at 2 a. m., lasting about 5 minutes, prostrated trees and fences. At Palestine, Tex., a heavy wind and rain storm from the west began 12.05 a. m. The wind reached a velocity of 60 miles per hour for a few minutes, blowing down two buildings and causing other damage. The gale continued about 30 minutes. A report from Red Bluff, Cal., stated that trains were delayed by heavy snow in the mountains.

2d.—Severe storms prevailed from the Lake region to the New England coast. At Boston, Mass., rain fell in the afternoon, and the wind reached a velocity of 39 miles per hour from the southeast. A southeast gale and rain prevailed at Woods Holl, Mass., in the afternoon. A heavy storm raged over Long Island Sound and southern New England. A heavy rainstorm, with high south wind, prevailed at Philadelphia, Pa., in the morning. A second wind and rain storm occurred in the evening. At Buffalo, N. Y., a southwest gale, with snow, prevailed during the afternoon and at night, the wind attaining a velocity of 48 miles per hour at 2.35 p. m. The severest storm of the season was reported at Sault de Ste. Marie, Mich. Rain changed to snow in the early morning, and ended 3.45 p. m. High northeast backing to northwest winds were attended by a temperature fall of 39° in 24 hours, and snow drifted to a depth of 3 feet. At Manistee, Mich., the wind reached a velocity of 60 miles per hour from the northwest. At Grand Haven, Mich., the wind veered to northwest after midnight and increased to a gale, with snow. At Chicago, Ill., snow fell in the morning, and high winds prevailed, reaching a velocity of 55 miles per hour from the west. A heavy snowstorm was reported in southern and western Colorado. At Key West, Fla., the wind changed from southwest to northwest at 1.45 p. m., and increased to 32 miles per hour at 6 p. m. Strong to high northwest wind continued during the 3d, a velocity of 38 miles per hour being reached at 12.20 p. m. The barometer continued high and rising, with decidedly lower temperature, the evening of the 3d.

5th.—Severe local storms were reported in Alabama, Georgia, and South Carolina. At Auburn, Ala., the morning was cloudy, with rain. In the evening sheet lightning, with low, muttering thunder, occurred in the northwest, and from 10 p. m. until 1 a. m., 6th, heavy rain, with lightning and loud thunder, prevailed. The next day a tornado was reported in the east-central part of the state. It passed through northern Chambers and southern Randolph counties, seriously injuring several persons, and causing considerable damage to property. About 6 p. m. a destructive tornado moved southeast over Fayetteville, Ga. The storm was first observed in the northwest as a blue-black cloud. Shortly before 6 p. m.

there was a dead calm, and a peculiar roaring sound was heard as the storm cloud approached. The cloud assumed a funnel shape; the outside of the cylinder appeared fringed with fire, and the interior appeared a black, seething mass. It bounded like a huge ball, and demolished objects at points where it touched the earth. When it struck the earth the cloud appeared to be shaken and rent asunder; it would rise and apparently renew its strength, and again descend to the earth. The path of destruction was about 200 yards in width, and the passage of the tornado was followed by heavy rain. Three persons were reported killed; a number of persons were seriously injured; 30 buildings were destroyed, and many other buildings were damaged. The estimated damage to property was \$30,000 to \$50,000.

Late in the afternoon a tornado was reported 3 miles west of Millen, Ga. The path was reported about 200 yards in width, and a number of buildings were destroyed. At Atlanta, Ga., rain began 10.30 p. m., and at 10.35 p. m. the wind reached a velocity of 45 miles per hour, with heavy rain. A heavy thunderstorm then set in and continued until nearly midnight. About midnight a tornado, moving from the northwest, occurred at Cashs Depot, in the north part of Darlington county, S. C. The storm was attended by lightning; several persons were injured; and a number of buildings were demolished.

6th.—Severe local storms occurred in Florida and Georgia, and a wind and snow storm prevailed over the middle Atlantic and New England states. A tornado passed about one mile south of Oakland, Fla., at 11 a. m. It moved east by north and changed course to east by south, and was attended by a roaring or rushing sound. Heavy rain fell during and after its passage, and hail was reported some miles to the westward. The display of thunder and lightning about equaled that observed in a summer storm. One woman was killed, and property was destroyed to the value of about \$1,000. The storm was first observed as two dark hanging clouds, which apparently united. After the clouds met a whirling tornado cloud formed and moved eastward. Its action in an orange grove indicated converging winds from two directions, and beyond that point trees were generally blown in the direction of the storm's movement and fell somewhat towards the center of the path. After crossing Johns Lake the storm cut a path about 100 yards in width and prostrated trees in a path 230 yards in width. The path narrowed to 30 to 40 yards in width. The funnel did not appear to touch the ground, but was observed to lower from, and rise to, the cloud. In the morning a waterspout was seen on Lake Apopka, northeast of the track, and a tornado was reported at Tavares, Fla. A violent thunderstorm passed over Augusta, Ga., between 1 and 2 p. m.; rain fell in the city, and hail 3 miles to the westward. The wind was high from the south, becoming variable. The temperature fell from 63° to 46°, and the pressure was 29.20 (actual) at 2.20 a. m. At Wilmington, N. C., a southwest wind, with rain, increased to a gale at 1.40 a. m., and reached a velocity of 46 miles per hour at 5.10 a. m. The pressure decreased rapidly, and at 2 p. m. the reduced reading was 29.39; after which the wind shifted to west, and the barometer commenced to rise. A heavy snowstorm prevailed over Virginia, Maryland, and eastern Pennsylvania, and high north to east gales, with snow, prevailed along the middle Atlantic and New England coasts. Snow fell to a depth of 17 inches at Buffalo, N. Y., delaying trains. Snow fell at Buffalo on the 7th, and high winds continued at that place until the 9th.

9th.—An unusually heavy snowstorm prevailed over parts of Tennessee and the east Gulf states.

10th.—A heavy snowstorm prevailed from Nebraska to northern Texas, and in Virginia.

11th.—Very heavy rain commenced in the Etowah and Oostanaula valleys, Georgia, and continued until the 14th, the rainfall during this period being 7 and 9 inches at Rome and Resaca, respectively. At Memphis, Tenn., sleet began in the early morning and continued, at intervals, with snow during

the 11th and 12th, interrupting traffic. At Nashville, Tenn, rain alternated with sleet.

12th.—Heavy rain, with sleet, prevailed in Tennessee and in parts of the middle and east Gulf states on the 12th and 13th, and this condition extended over the Ohio Valley, the lower lake region, and the middle Atlantic coast during the 14th.

15th.—A heavy snowstorm prevailed in the Atlantic coast states from North Carolina to Maine.

17th.—A heavy snowstorm set in over the middle Mississippi and lower Missouri valleys, and extended over the Ohio Valley and the middle and west Gulf states during the 18th and 19th.

21st.—Snow, and a southeast gale reaching 55 miles per hour, prevailed at Buffalo, N. Y.

25th.—High southerly winds prevailed along the Pacific coast. At Eureka, Cal., the barometer fell one-third inch in the 12 hours preceding 8 a. m. The wind increased to a gale from the south at 8.30 a. m., and continued high until noon, causing slight damage to property; rain fell in the afternoon. Some damage was caused to buildings in San Francisco, Cal., by high wind.

26th.—A severe northwest gale prevailed from Virginia to the south New England coast, and continued during the 27th. At Cape Henry, Va., the wind reached a velocity of 50

miles per hour at 10.50 a. m., and continued high during the 27th. A three-masted schooner was driven ashore, but was floated off by a wrecking vessel after the gale subsided. At Yuma, Ariz., a rainstorm set in and continued, at intervals, until the 30th.

27th.—Several marine disasters were reported near New York City during a northwest gale. Drifting snow caused a blockade of street car lines at Buffalo, N. Y.

28th.—Rain began at Port Angeles, Wash., in the afternoon and continued during the 29th, causing streams in Clallam county to overflow their banks.

29th.—The British ship "Ferndale," with 20 of her crew, was reported lost on the Washington coast 9 miles north of the entrance to Grays Harbor.

30th.—A heavy northeast gale prevailed on the southeast New England coast during the 29th and 30th. At Eureka, Cal., high wind and rain prevailed in the early morning. The schooner "Mable Gray" was wrecked north of Cape Mendocino; no lives were lost. A thunderstorm from the southeast began at Tucson, Ariz., 2.02 p. m., and lasted 25 minutes. At 6 p. m. a high wind sprung up from the west and continued one hour, reaching a velocity of 39 miles per hour at 6.10 p. m. The barometer rose .10 inch in 30 minutes. During a thunder and sleet storm at Estalina Springs, N. Mex., some cattle on exposed places on the range were killed.

INLAND NAVIGATION.

ICE IN RIVERS AND HARBORS.

The Hudson River was full of floating ice at Albany, N. Y., on the 9th; near Troy, N. Y., the river was closed by ice. On the 15th the river was clear of ice at Albany, N. Y., and the water was very high.

The Raritan River was closed by ice at New Brunswick, N. J., on the 26th.

Floating ice was reported in the Susquehanna River at Wilkes Barre, Pa., on the 10th, 11th, and 18th; on the 15th the river was clear of ice, and on the 19th it was closed by ice. At Lock Haven, Pa., the Susquehanna River was partly frozen on the 7th, 8th, and 22d to 24th; frozen on the 9th to 12th and 26th to 31st; ice partly gone on the 13th; ice moving out on the 14th and 16th to 18th; and slush ice on the 20th and 21st. On the 28th the Susquehanna was frozen over at Havre de Grace, Md.

The Clarion River was frozen at Clarion, Pa., on the 10th; river clear of ice on the 14th.

Ice was running in the Youghiogheny River at West Newton, Pa., on the 4th, 8th, 9th, and 27th.

Floating ice was reported in the Allegheny River at Freeport, Pa., on the 6th, and from the 9th to 12th the river was frozen.

The Monongahela River was frozen at Greensborough, Pa., on the 10th; river clear of ice on the 13th; navigation closed on the 27th. At Lock No. 4, Pa., ice was floating in the Monongahela River on the 8th, 9th, 11th, 12th, 20th to 22d, 26th, 30th, and 31st; river frozen on the 10th and 27th to 29th; ice running out on the 13th, and the river was clear of ice on the 14th.

Ice broke up in the Little Kanawha River at Glenville, Pa., on the 12th.

Ohio River.—At Pittsburg, Pa., navigation was suspended to points on the Ohio River on the 13th on account of heavy ice; 14th, floating ice in Allegheny River; 21st to 25th, floating ice in both rivers; 26th, floating ice in both rivers, and navigation to points above closed on account of ice and low water; 27th, floating ice in both rivers; 31st, navigation resumed on the Monongahela River, and the river free from ice. At Parkersburg, W. Va., heavy ice was reported from the 6th to 9th; ice 6 inches in thickness was running on the 10th; 20th to 28th, heavy ice; 29th, but few boats running on account of

heavy ice; ice in river 30th and 31st. At Louisville, Ky., river filled with floating ice on the 12th; navigation partially suspended on the 13th, 14th, and 15th on account of ice; river clear and navigation fully resumed on the 17th. The river was full of floating ice at Vevay, Ind., on the 11th. At Shawneetown, Ill., floating ice was reported from the 8th to 11th; navigation closed on the 12th, and opened on 20th.

Detroit River.—At Detroit, Mich., heavy ice was reported on the 3d; floating ice on the 5th, 6th, 8th, and 9th; 11th, ice backing up from below the city; 13th, large quantities of floating ice; 15th, river frozen over for the first time in several years; a heavy ice bridge formed below the city, delaying the transfer of trains of the Michigan Central, Grand Trunk, and Canadian Pacific Railroads; 18th, ice bridge increasing in size; 20th, river continued frozen and ice jam unbroken; 26th and 27th, heavy running ice; 30th, large quantities of floating ice.

Saint Clair and Black Rivers.—At Port Huron, Mich., the Black River was frozen and the Saint Clair River full of floating ice on the 4th; 7th, floating ice in the Saint Clair River; 8th, Saint Clair River full of floating ice, rendering navigation to Detroit difficult; Lake Huron frozen as far as could be seen; 9th to 11th, floating ice in Saint Clair River; 12th, Saint Clair River full of floating ice, and frozen over from Fort Gratiot to Point Edward; river also reported blocked at Saint Clair, 12 miles below Port Huron; 13th, ice in Sarnia Bay 8 inches in thickness; 26th, Saint Clair River blocked with ice between Port Huron and Sarnia, and ferryboats discontinued their trips; 27th, Saint Clair River frozen over, and for the first time in a number of years persons were crossing on the ice.

At Lansing, Mich., the Grand River was frozen on the 3d, and on the 20th the ice was 9 inches in thickness.

At Sault de Ste. Marie, Mich., the Saint Marys River was frozen over for the first time this season on the 3d, and ferryboats were compelled to discontinue their trips.

Mississippi River.—At Red Wing, Minn., loaded teams were crossing on the ice on the 4th; on the 18th the ice was 24 inches in thickness. At Dubuque, Iowa, the river was frozen over on the 9th; on the 13th the ice was 15 inches, and on the 20th it was 20 inches in thickness. At Davenport Iowa, the river was frozen over on the 7th; 11th, persons crossing on the